Projection of Solids-Introduction, Types, Important terms

Prerequisite/Recapitulations

- Drawing, Sketching
- Basics of Engineering Graphics
- Basics of Projections

Objectives

To acquire knowledge about:

- Projection of solid
- Types of solid
- Important Terms Used in Projections of Solids

Introduction

Definition of Solid:

A solid is a three dimensional object having length, breadth and thickness. It is completely bounded by a surface or surfaces which may be curved or plane.

-The shape of the solid is described by drawing its two orthographic views usually on the two principle planes i.e. H.P. & V.P.

-For some complicated solids, in addition to the above principle views, side view is also required.

-A solid is an aggregate of points, lines and planes and all problems on projections of solids would resolve themselves into projections of points, lines and planes.

GALGOTIAS UNIVERSITY

Introduction

Classification of Solids

Solids may be divided into two main groups;

(A) Polyhedra

(B) Solids of revolution

(A) Polyhedra :

A *Polyhedra* is defined as a solid bounded by planes called *faces* which meet in straight lines called *edges*.

Polyhedra

There are *seven* regular Polyhedra which may be defined as stated below;

(1) Prism

(2) Pyramid

(3) Tetrahedron

(4) Cube or Hexahedron:

(5) Octahedron:

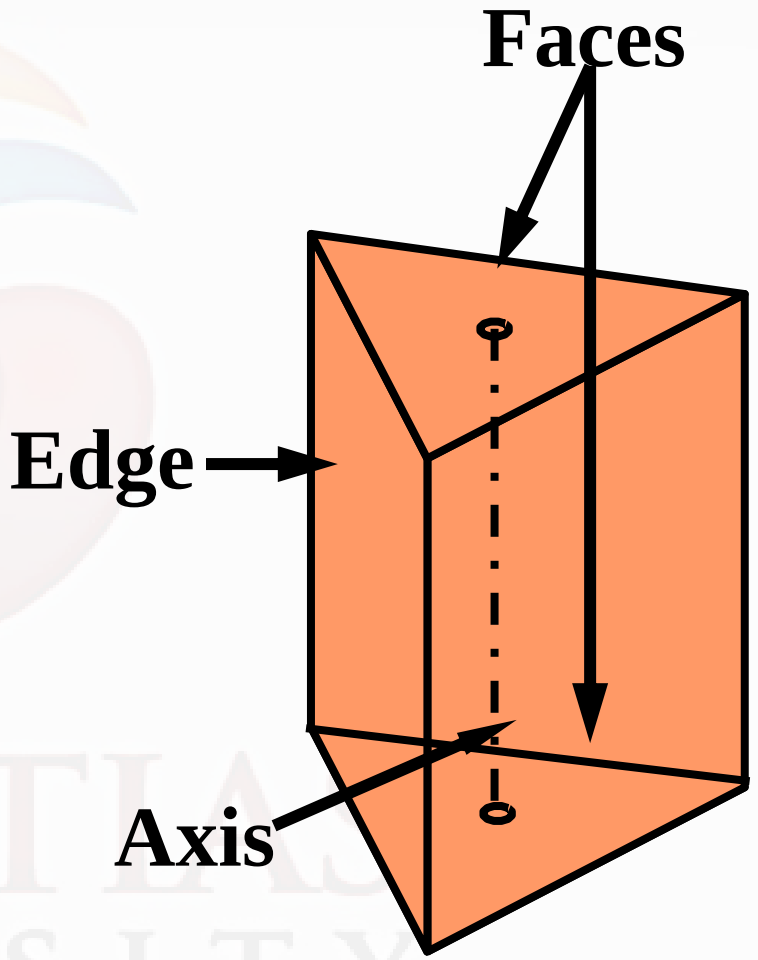
(6) Dodecahedron:

(7) Icosahedron:

Prism

It is a polyhedra having *two equal and similar faces* called its ends or bases, parallel to each other and joined by other faces which are *rectangles*.

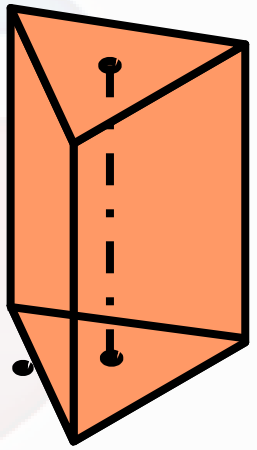
-The imaginary line joining the Centers of the bases or faces is called *Axis* of Prism.



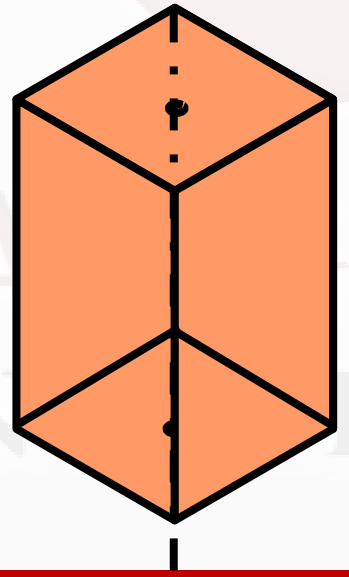
Classification of prism

According to the shape of its base, prism can be sub classified into following types:

(a) Triangular Prism:

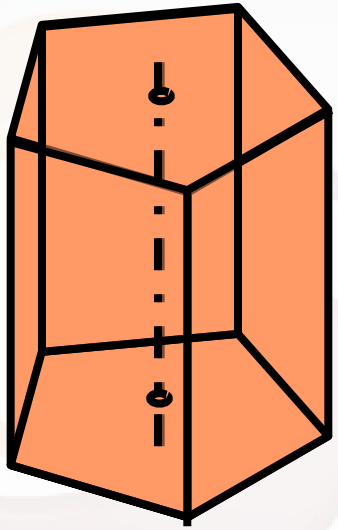


(b) Square Prism:

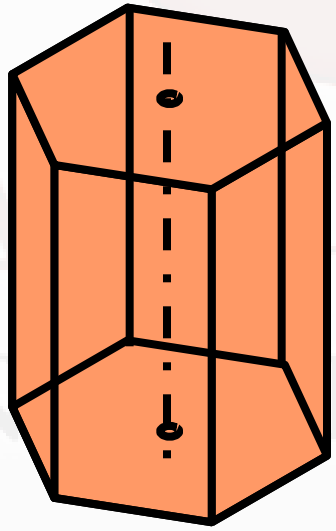


Classification of prism

(c) Pentagonal Prism:

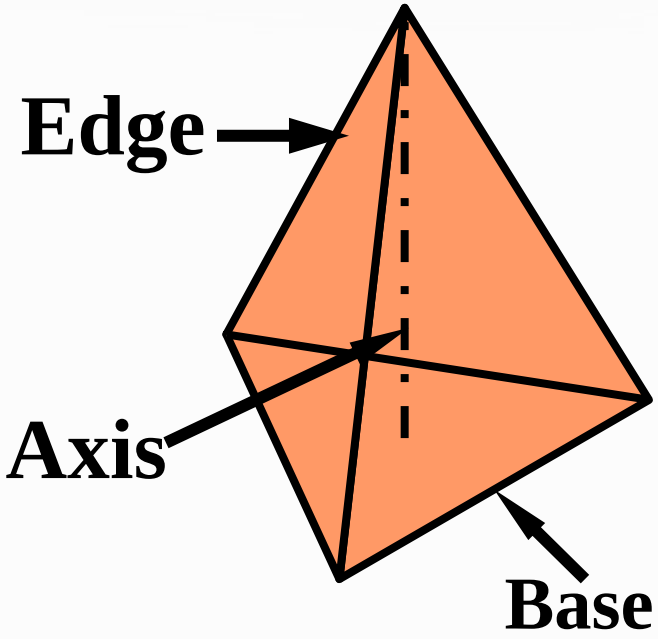


(d) Hexagonal Prism:



Pyramid

This is a polyhedra having plane surface as a base and a number of triangular faces meeting at a point called the *Vertex* or *Apex*.

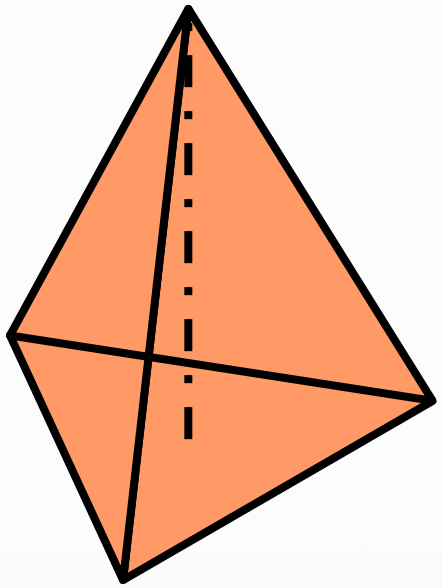


-The imaginary line joining the Apex with the Centre of the base is called *Axis* of pyramid.

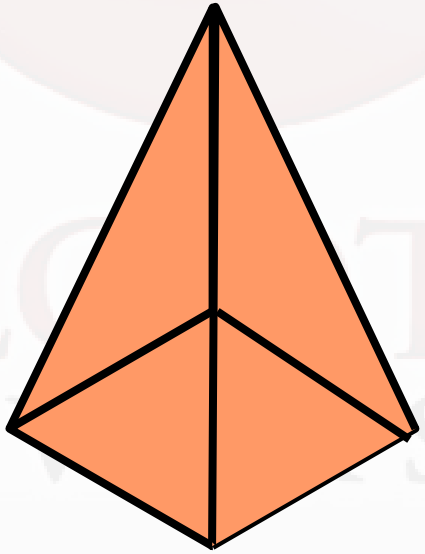
Classification of pyramid

According to the shape of its base, pyramid can be sub classified into following types:

(a) Triangular Pyramid:

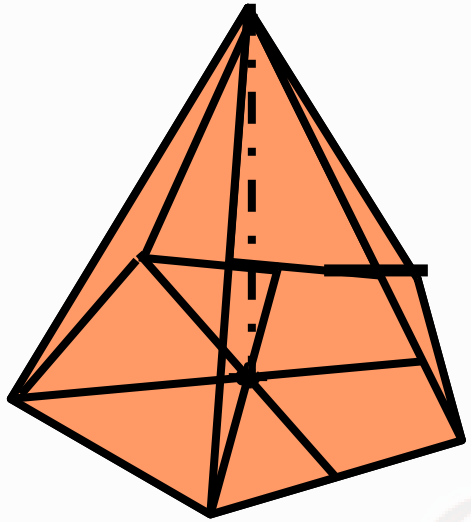


(b) Square Pyramid:

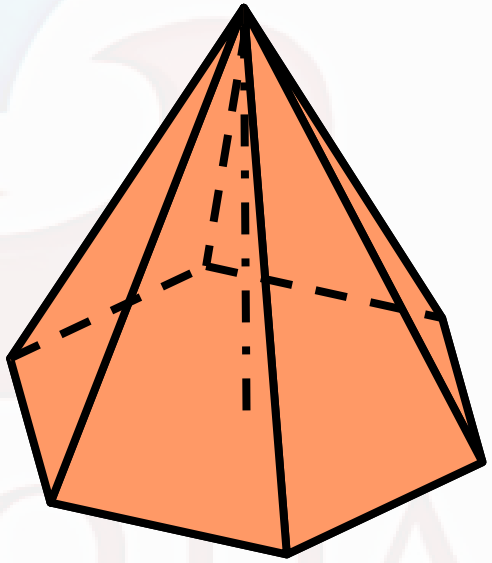


Classification of pyramid

(c) Pentagonal Pyramid:



(d) Hexagonal Pyramid:



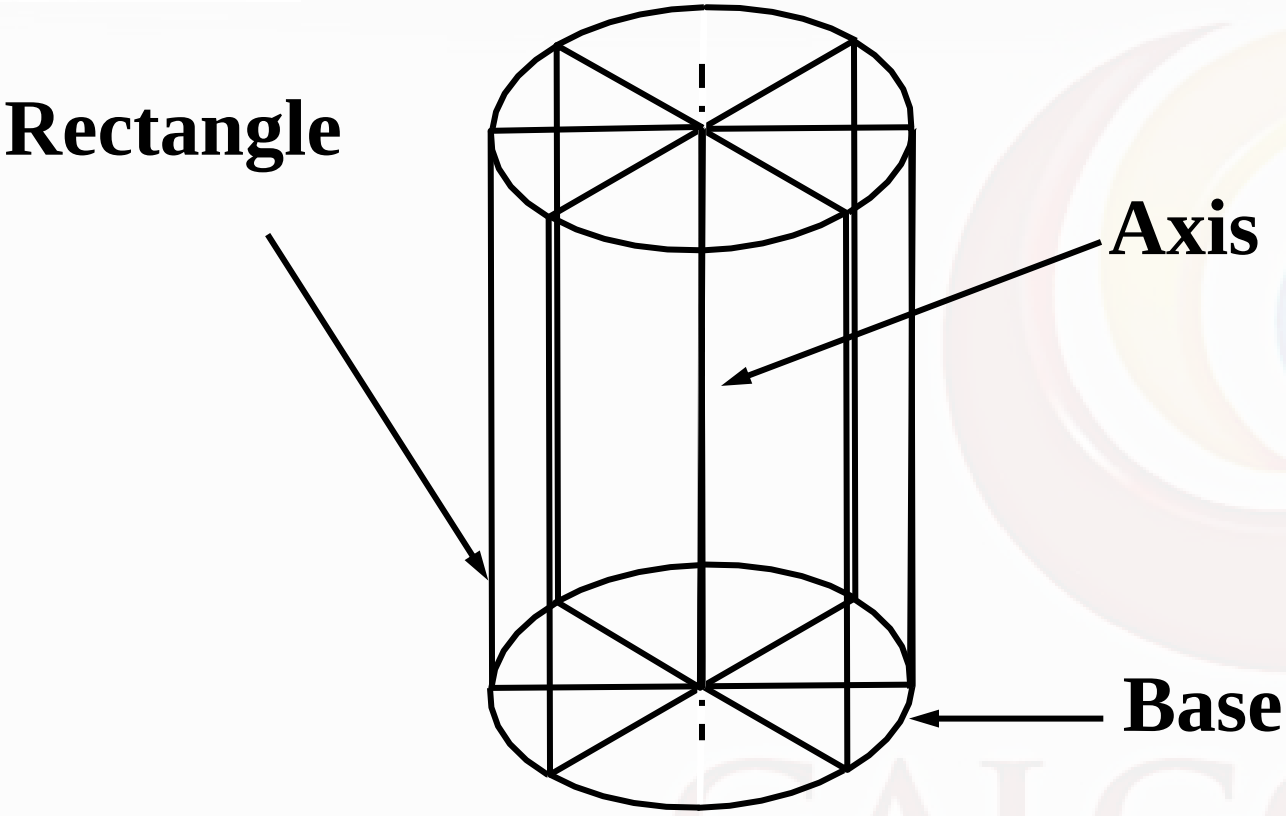
Solids of Revolutions

When a solid is generated by revolutions of a plane figure about a fixed line (Axis) then such solids are named as *solids of revolution*.

Solids of revolutions may be of following types;

(1) Cylinder
(2) Cone
(3) Sphere
(4) Ellipsoid
(5) Paraboloid
(6) Hyperboloid

Types of solids of Revolutions



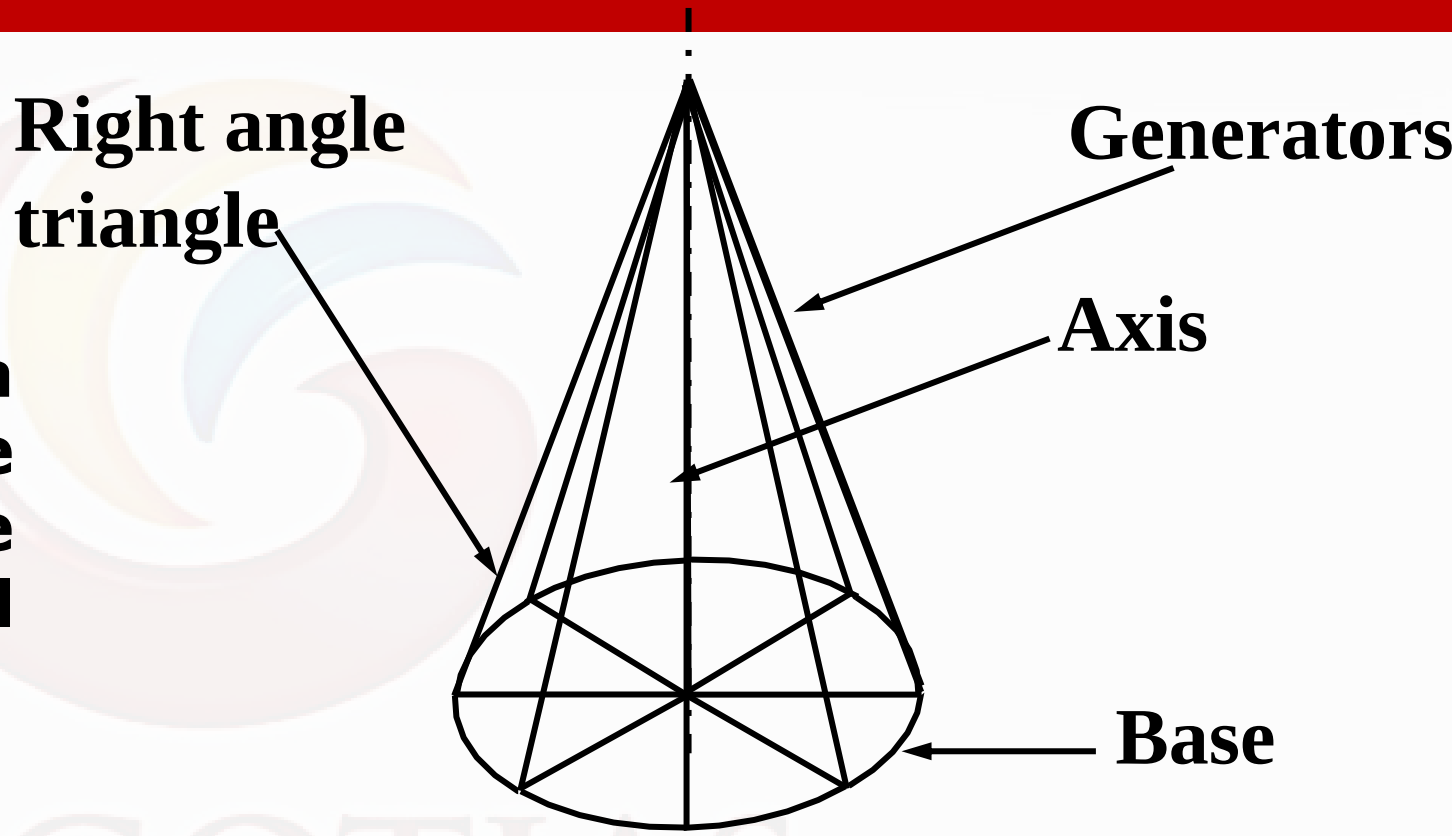
(1) Cylinder:

A right regular cylinder is a solid generated by the revolution of a rectangle about its vertical side which remains fixed.

Types of solids of Revolutions

(2) Cone:

A right circular cone is a solid generated by the revolution of a right angle triangle about its vertical side which remains fixed.



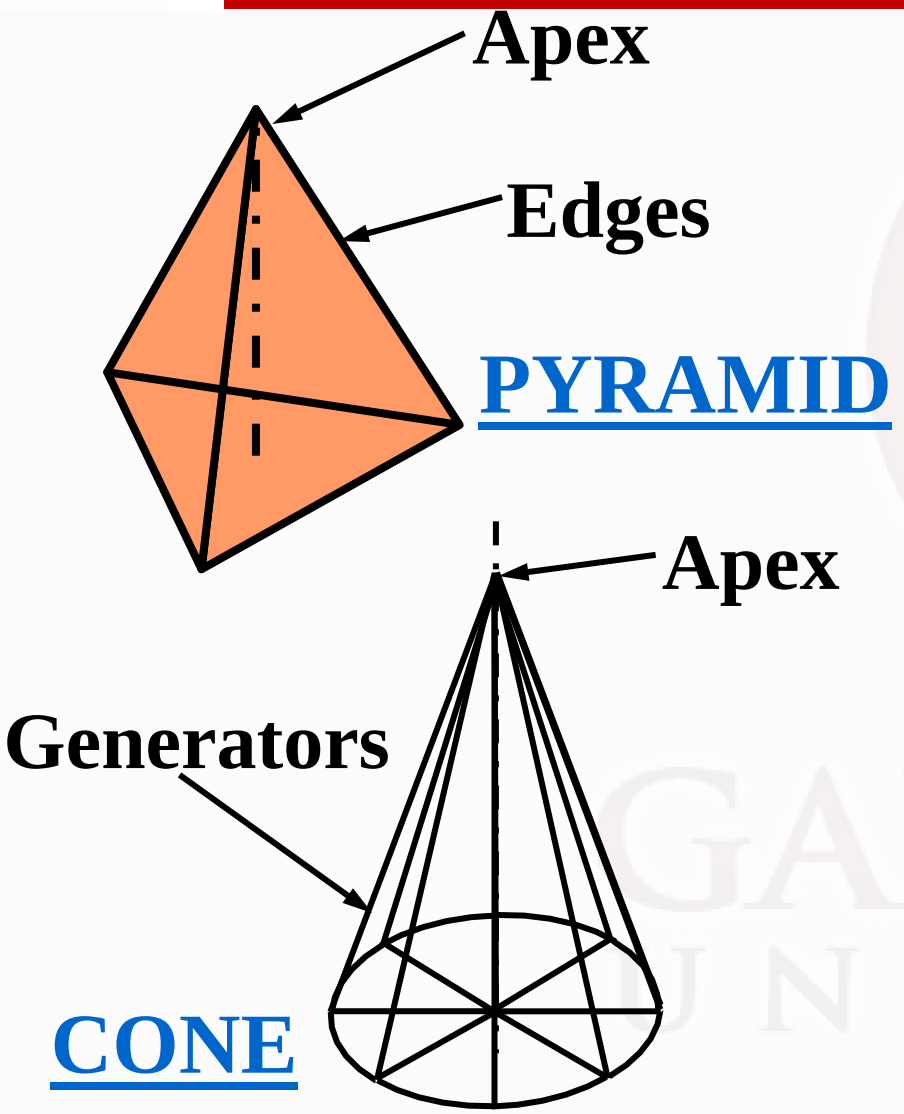
Important Terms Used in Projections of Solids:

(1) Edge or generator:

For *Pyramids* & *Prisms*, edges are the lines separating the triangular faces or rectangular faces from each other.

For *Cylinder*, generators are the straight lines joining different points on the circumference of the bases with each other

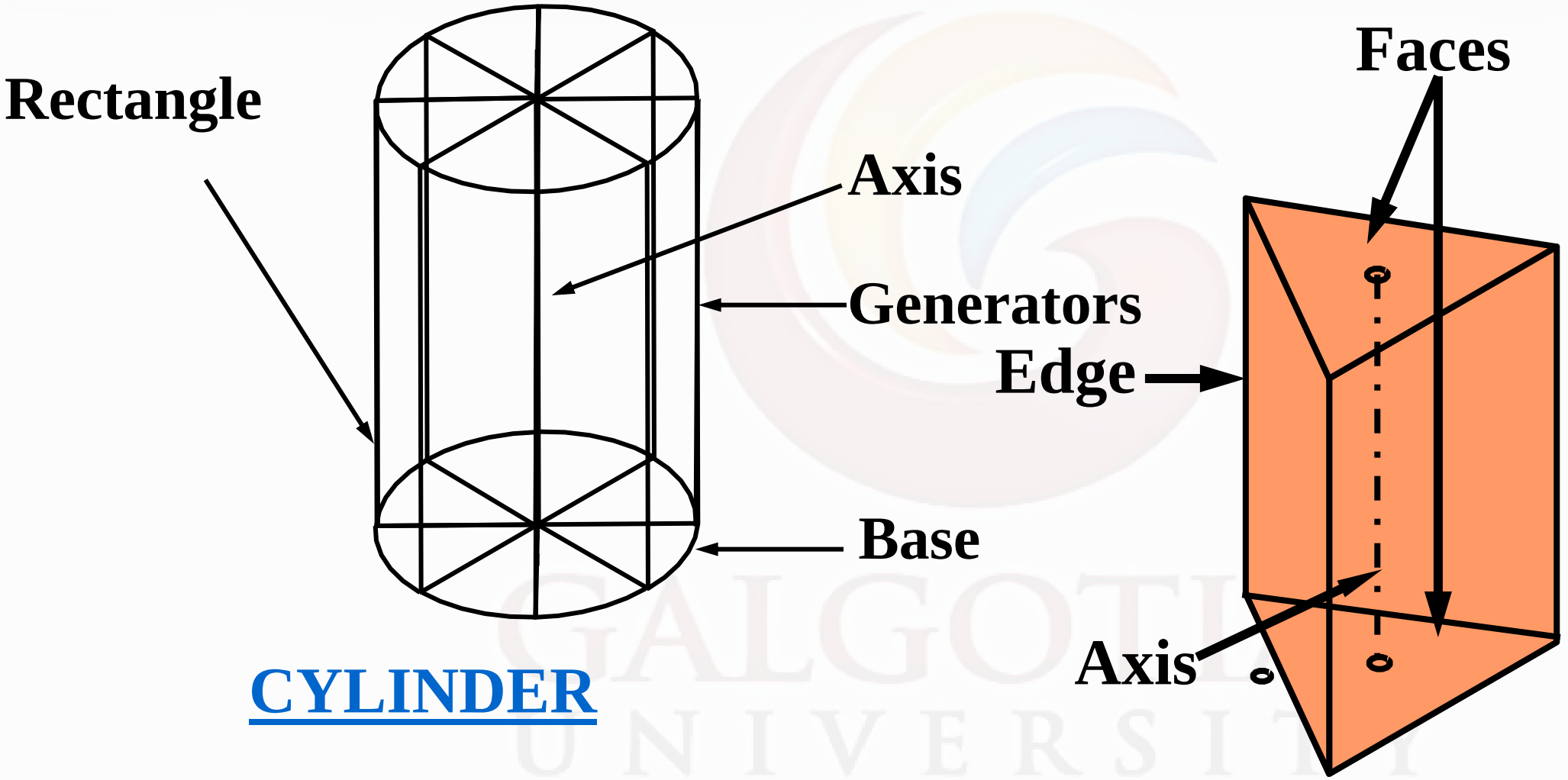
Important Terms Used in Projections of Solids:



(2) Apex of solids:

For *Cone and Pyramids*, Apex is the point where all the generators or the edges meet.

Important Terms Used in Projections of Solids:



CYLINDER

PRISM

Important Terms Used in Projections of Solids:

(3) Axis of Solid:

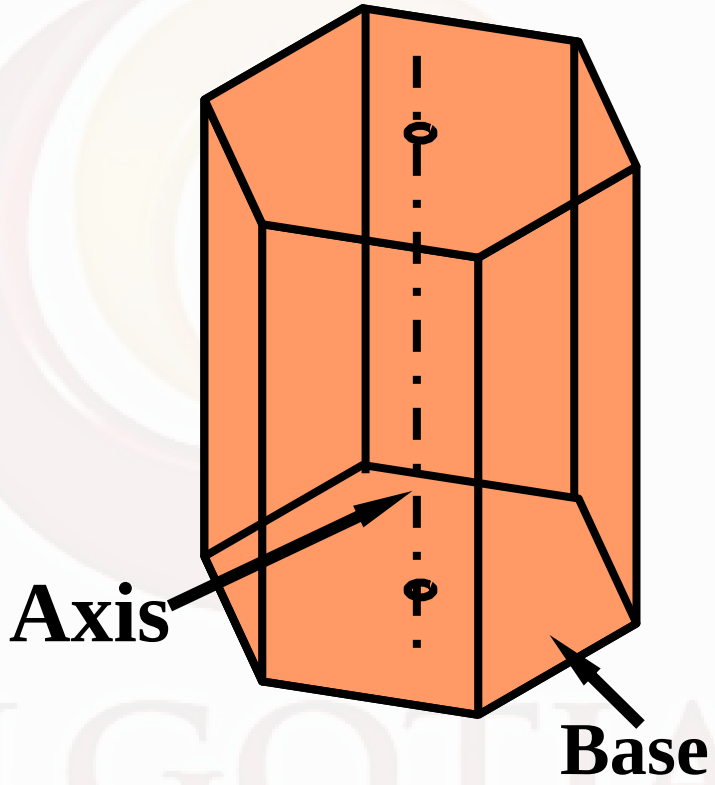
For *Cone and Pyramids*, Axis is an imaginary *line joining centre of the base to the Apex*.

For *Cylinder and Prism*, Axis is an imaginary *line joining centres of ends or bases*.

Important Terms Used in Projections of Solids:

(4) Right Solid:

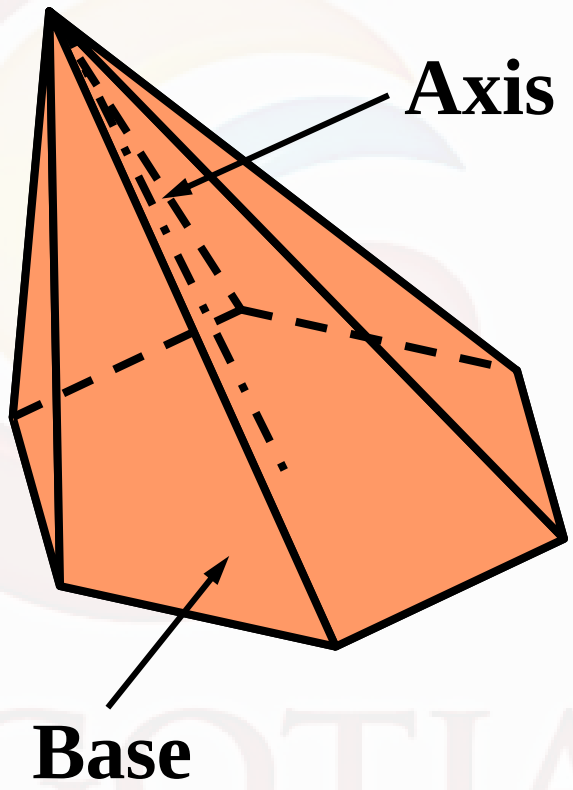
A solid is said to be a *Right Solid* if its <u>axis is perpendicular to its base.</u>



Important Terms Used in Projections of Solids:

(5) Oblique Solid:

A solid is said to be a *Oblique Solid* if its axis is inclined at an angle other than 90° to its base.



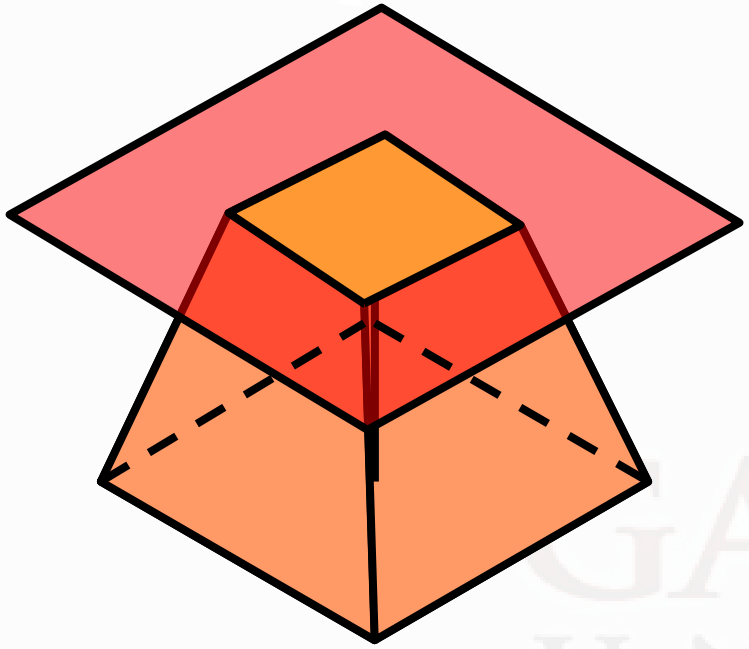
Important Terms Used in Projections of Solids:

(6) Regular Solid:

A solid is said to be a *Regular Solid* if all the edges of the base or the end faces of a solid are equal in length and form regular plane figures

Important Terms Used in Projections of Solids:

CUTTING PLANE PARALLEL TO BASE



FRUSTUM OF A PYRAMID

(7) Frustum of Solid:

When a *Pyramid* or a *Cone* is cut by a Plane parallel to its base, thus removing the top portion, the remaining *lower portion* is called its frustum.

Important Terms Used in Projections of Solids:

(8) Truncated Solid :

When a ***Pyramid*** or a ***Cone*** is cut by a Plane inclined to its base, thus removing the top portion, the remaining *lower portion* is said to be truncated.

Summary

Solid is a 3-D object having length, breadth and thickness and bounded by surfaces which may be either plane or curved, or combination of the two.

Solid is basically of two types:

Polyhedron

Solids of revolution

Questions

- What is the difference between solid of revolution and polyhedral?
- State the difference between prism and pyramid.
- A right regular pentagonal prism, side of base 30 mm and height of axis as 75mm rests on HP on one of its base corners such that its long edge containing the corner is inclined to the HP at 60°. Draw its projections.

References

- K C John (2009), Engineering Graphics for Degree, Prentice Hall of India. ISBN: 978-8-120-33788-3.
- P N Rao (2010), CAD/CAM Principles and Applications, 3rd Edition, Tata McGraw-Hill Education, ISBN: 978-0-070-68193-4.
- NPTEL

GALGOTIAS UNIVERSITY

Thank You